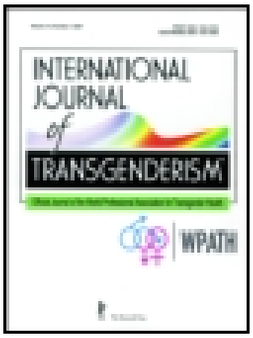

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Exploring rates of transgender individuals and mental health concerns in an online sample

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ABSTRACT

Background: Prevalence estimates of adults identifying as transgender are scarce, particularly in the United States. ***Method:*** The current study endeavored to estimate the prevalence of individuals identifying as transgender in a large online sample of adult U.S. residents ($n = 6{,}727$) and compare the prevalence of common mental health disorders (depression, anxiety, attention-deficit/hyperactivity disorder) and the age of onset for individuals identifying as men or women versus those identifying as transgender. ***Results:*** The prevalence estimate of individuals identifying as transgender was 0.8%. Individuals identifying as transgender were significantly more likely than individuals identifying as men or women to report having had a single diagnosis or co-occurring diagnoses for all three disorders examined. Additionally, transgender individuals were more likely than individuals identifying as men or women to receive a diagnosis of anxiety or depression at a younger age. ***Conclusion:*** Given the prevalence of transgender individuals and the associations with common mental health conditions, clinicians must be informed and competent to care for their clinical needs. This study introduces online crowdsourcing resources as a potentially fruitful option for reaching and researching gender diversity.

KEYWORDS
Gender; mental health; minority stress; online sampling; transgender

The field of psychology is still in its infancy in terms of understanding gender identity development and its association with mental health concerns. Only the newest iteration of the American Psychiatric Association's *Diagnostic and Statistical Manual* acknowledges a spectrum of gender conformity as opposed to a gender binary (male/female; American Psychiatric Association, 2013). However, we know very little about the prevalence of adults who do not identify on the gender binary. We know less about the mental health concerns of gender-variant individuals, a notable deficit in our collective knowledge that may impact our ability to competently care for this population. Although it is a difficult task to provide accurate prevalence estimates, the closer we come to achieving an estimate, the greater understanding we can have for the nuanced needs of this population. Such research is sorely needed as gender-variant adults present with unique health needs (Daniel & Butkus, 2015). Thus, the purposes of this paper are to explore the prevalence of relevant mental health concerns among this population relative to individuals identifying with the gender binary. The current research aims only to provide a first step in what will likely be a long line of research into the unique needs of gender-nonconforming individuals. Of note, in this paper we use the terms *gender nonconformity*, *gender variant*, and *transgender* without clear distinction. We elected predominantly to use *transgender* in an effort to be inclusive of individuals who generally identify as conforming unambiguously with conventional male or female identities (e.g., transgender men, transgender women, nonbinary/gender queer individuals). Terms related to gender nonconformance are not consistently defined in the literature (Coleman et al., 2012). Thus, we use this language to reflect the variety of terms used in the extant literature.

Prevalence estimates of adults identifying as gender-variant are scarce, particularly in the United States (Coleman et al., 2012; Flores, Herman, Gates, & Brown, 2016; Gates, 2011; Rosser, Oakes, Bockting, & Miner, 2007). Transgender prevalence estimates within the United States generally range from 0.3% to 0.6% (Flores et al., 2016; Gates, 2011). The Gates (2011) study and others examining the prevalence of transgender adults often contain notable biases, largely

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relying on restrictive samples, such as individuals identified from high-risk populations (such as individuals engaged in sex work or substance use), individuals involved in transgender community mailing lists, journals, and forums (Rosser et al., 2007) or individuals who present at clinics and have access to health care (Coleman et al., 2012). The Flores et al. (2016) study used a more representative sample based on a large Centers for Disease Control study. However, states were permitted to opt-in to querying about transgender identity, and only 19 states did so. Acknowledging these limitations, our current knowledge base is potentially excluding a large percent of transgender individuals who are less connected with the transgender community, who are mistrusting of health care, who do not have access to health care, or who live in more isolated areas (e.g., rural areas). Indeed, transgender individuals report widespread discrimination in health care (Bradford, Reisner, Honnold, & Xavier, 2013; Kanamori & Cornelius-White, 2016; Shipherd, Green, & Abramovitz, 2010), highlighting the importance of our field to find a way to reach and support this community. Further, given both the substantial internal (e.g., distress associated with gender nonconformance) and external (e.g., prejudice) stress associated with gender nonconformance (Adams, Nagoshi, Filip-Crawford, Terrell, & Nagoshi, 2016; Bockting, Miner, Swinburne Romine, Hamilton, & Coleman, 2013; Hendricks & Testa, 2012), transgender adults may feel uncomfortable reporting their gender identity in situations in which they do not perceive as anonymous, confidential, or safe (Gates, 2011; Rosser et al., 2007). Survey methods that are anonymous in nature can enhance the likelihood of getting accurate prevalence estimates. Researchers have recommended that Internet studies offering anonymity and confidentiality might obtain more accurate responses and more generalizable samples than other forms of convenience sampling, with consideration of the reach of web-based surveys (i.e., to more geographically isolated individuals and individuals who are not open about their gender identity (Bockting et al., 2013; Gates, 2011; Rosser et al., 2007).

In addition to assessing the prevalence of transgender individuals, researchers have begun to assess the mental health needs of transgender adults. Various studies indicate that transgender adults experience high rates of internalizing disorders, such as depression, anxiety, somatization (Bockting et al., 2013; Bouman et al., 2017; Budge, Adelson, & Howard, 2013; Millet, Longworth, & Arcelus, 2017; Warren, Bryant Smalley, & Nikki Barefoot, 2016); substance use; and suicidal ideation/attempts (Bockting, Robinson, Forberg, & Scheltema, 2005; Hendricks & Testa, 2012). Transgender children and adolescents are also at greater risk for depression and anxiety than youth whose gender identity is male or female (Coleman et al., 2012; Rosenberg, 2002). Relative to male/female adolescents, transgender adolescents are also likely to have diagnoses of co-occurring externalizing disruptive behavior disorders, such as oppositional defiant disorder (Coleman et al., 2012). However, it is unclear whether they are more likely to have disruptive behavior disorders that are neurodevelopmental in etiology, such as attention-deficit/hyperactivity disorder (ADHD). Understanding the course of mental health concerns, including the initial age of diagnosis, may help elucidate whether therapeutic services need to be offered earlier in development for gender nonconforming individuals and to better understand the relationship across time between mental health issues and transgender identities.

One Internet resource that has proven to be useful in obtaining large-scale and generalizable samples is Amazon's Mechanical Turk (MTurk; mturk.com; Sheehan & Pittman, 2016). MTurk is the largest and most used online crowdsourcing marketplace wherein "workers" complete experiments and surveys online for small compensation (Chandler & Shapiro, 2016; Paolacci & Chandler, 2014; Shank, 2016). MTurk workers are identified by an ID not linked to their names, providing a framework for worker anonymity compared to "offline" samples (Shank, 2016). Researchers have found evidence for reliable, efficient, and inexpensive data collection within a diverse population of workers (Behrend, Sharek, Meade, & Wiebe, 2011; Buhrmester, Kwang, & Gosling, 2011). Given the growing utilization of MTurk, demographic characteristics are well examined, specifically among workers in the United States (cf. Chandler & Shapiro, 2016). Samples from MTurk are more representative of the U.S. population than typical convenience samples, but not as representative as national probability samples (Sheehan & Pittman, 2016). MTurk workers are naturally more representative of Internet users than non–Internet users, thus they tend to be younger and better educated and they over-represent Euroean Americans and Asian Americans (cf. Chandler &

Shapiro, 2016). MTurk workers demonstrate similar prevalence of clinical mental health diagnoses and symptoms relative to their offline counterparts, particularly when examining depression, anxiety, and ADHD (Shapiro, Chandler, & Mueller, 2013; Wymbs & Dawson, 2015). For purposes of this study, it is notable that some researchers have claimed that the LGBTQ population is more prevalent on MTurk than in the population in general (cf. Chandler & Shapiro, 2016). However, cited studies assessed only sexual orientation (Reidy, Berke, Gentile, & Zeichner, 2014; Shapiro et al., 2013) or conflated gender and sexual orientation "LGBT" (Corrigan, Bink, Fokuo, & Schmidt, 2015). Thus, transgender identity is not well assessed on MTurk. A review of reliability and validity data of MTurk workers concluded that workers are consistent or superior to convenience samples collected through different methods (cf. Chandler & Shapiro, 2016). Indeed, workers generally report more comfort in reporting sensitive information online than do individuals assessed in person (cf. Chandler & Shapiro, 2016). Thus, the possibility of obtaining a better understanding of the prevalence and relevant mental health concerns of transgender individuals through MTurk may help to ameliorate previous limitations in the extant research and provide a unique online prevalence estimate.

Current study

The current study sought to explore the prevalence of individuals identifying as transgender on Amazon's MTurk and to explore the mental health correlates of transgender identification. This study had three main aims: (1) to explore the prevalence of individuals self-identifying as transgender in a large sample of adults who resided in the United States; (2) to explore the prevalence of common mental health disorders (i.e., depression, anxiety, ADHD) reported by individuals self-identifying as transgender as compared to individuals identifying on the gender binary (i.e., male/female); and (3) to examine differences in age of initial diagnosis among individuals identifying on or off the gender binary. We did not formulate a hypothesis regarding the prevalence of individuals identifying as transgender given the lack of previous research assessing prevalence in a non–treatment-seeking sample of U.S. adults. We did, however, hypothesize that individuals identifying as transgender would have significantly greater rates and earlier reported diagnostic age of anxiety and depression than individuals identifying on the gender binary but that they would not differ in their rates or age of diagnosis for ADHD.

Method

Participants

The sample for the current study was recruited through Amazon's Mechanical Turk. A total of 6,727 individuals identifying as U.S. residents[1] completed the survey across two cohorts. The first cohort of 2,770 eligible workers was recruited in 16 days between January and February, 2014. The second cohort of 3,957 eligible workers was recruited in 36 days between October and November, 2014. A qualifier was required so that individuals participating in the first cohort were ineligible to participate in the second cohort. With attention to the concerns about the integrity of online and relatively anonymous data collection (Kraut et al., 2004), data were carefully examined to ensure the most reliable responses. Workers indicating that they were under 18 years of age ($n = 2$; discrepant with MTurk's worker agreement), workers who did not provide information about their gender ($n = 7$), and workers who had an inconsistent/suspicious pattern of responding ($n = 7$) were excluded from analyses. The demographic information is provided in Table 1 and presented by gender category.

Procedures

This study was approved by the Ohio University Social-Behavioral Institutional Review Board in the state of Ohio in the United States. The study was advertised on MTurk as an academic survey. Study data were collected using REDCap, a secure, HIPPA-compliant electronic data capture tool for research (Harris et al., 2009). Prior to completing this survey, participants were required to acknowledge informed consent. Once participants completed the survey, participants were provided with a code to enter into the MTurk system to indicate completion and to receive compensation ($0.25, typical pay for MTurk workers completing brief tasks; Buhrmester et al., 2011).

Table 1. Demographic information of the MTurk sample as a function of gender identification.

	Gender Binary				
	Male	Female	Total (Binary)	Transgender	Difference
Age in years[a]					$X^2(4) = 17.37, p = .002$
18–25	1,297 (38.7%)	961 (29.1%)	2,258 (33.9%)	32 (59.3%)	
26–35	1,422 (42.5%)	1,305 (39.4%)	2,727 (41.0%)	17 (31.5%)	
36–45	386 (11.5%)	540 (16.3%)	926 (13.9%)	4 (7.4%)	
46–55	160 (4.8%)	317 (9.6%)	477 (7.2%)	0 (0.0%)	
56 +	81 (2.4%)	185 (5.6%)	266 (4.0%)	1 (1.9%)	
Missing	3 (0.1%)	0 (0.0%)	3 (0.05%)	0 (0.0%)	
Education					$X^2(7) = 10.50, p = .162$
Did not complete high school	29 (.9%)	18 (0.5%)	47 (0.7%)	0 (0.0%)	
High school	443 (13.3%)	412 (12.5%)	855 (12.9%)	4 (7.5%)	
Some college	1,004 (30.0%)	1,004 (30.4%)	2,008 (30.2%)	25 (46.3%)	
2-year degree	329 (9.8%)	380 (11.5%)	709 (10.7%)	8 (14.8%)	
Bachelor's degree	1,194 (35.7%)	1,125 (34.0%)	2,319 (34.8%)	15 (27.8%)	
Master's degree	279 (8.4%)	297 (9.0%)	576 (8.7%)	2 (3.7%)	
Doctoral degree	67 (2.0%)	70 (2.1%)	137 (2.1%)	0 (0.0%)	
Missing	4 (0.1%)	2 (0.1%)	6 (0.1%)	0 (0.0%)	
English, first language					$X^2(1) = 1.82, p = .177$
No	117 (3.5%)	100 (3.0%)	217 (3.3%)	0 (0.0%)	
Yes	3,226 (96.3%)	3,206 (96.9%)	6,432 (96.6%)	54 (100.0%)	
Missing	6 (0.2%)	2 (0.1%)	8 (0.1%)	0 (0.0%)	

Notes. Omnibus chi-square tests were conducted using (binary = 1; trans = 0).

Measures

Demographics

Each worker was asked to indicate their "gender" (response options: *male, female*, or *transgender/gender-variant*), their age range, their educational attainment, and whether English was their native language.

Diagnostic histories

Participants were asked whether they had ever been diagnosed with depression. If they endorsed having a history of depression, they were asked to indicate within what age range they were first diagnosed (*4 years or younger, 5 to 12 years, 13 to 17 years, 18 to 25 years, 26 to 35 years, 36 to 45 years, 46 years or older*). Parallel questions also assessed whether participants were ever diagnosed with ADHD or an anxiety disorder and, if so, within what age range they were first diagnosed. For ease of interpretation and clinical utility, age categories were collapsed to represent specific developmental periods: childhood (up to 12 years), adolescence (13 to 17 years), emerging adulthood (18 to 25 years), and adulthood (26 years and older).

Results

Gender in sample

The sample self-identified predominantly on the gender binary (male: $n = 3{,}349$ [49.9%], female: $n = 3{,}308$ [49.3%]), but 0.8% of the sample ($n = 54$) identified as transgender. Individuals identifying as transgender largely did not differ demographically from individuals identifying on the gender binary, with the exception of age (see Table 1). Transgender individuals were significantly younger than individuals identifying on the gender binary.

Prevalence of common mental health disorders

Considering that individuals identifying as transgender significantly differed from individuals identify on the gender binary in age, where appropriate, chi-square calculations were adjusted for age using the Cochran-Mantel-Haenszel (CMH) test. Nonsignificance across the Breslow-Day tests for each analysis indicated consistency in associations reported across each age strata.

Individuals identifying as transgender reported a significantly higher lifetime prevalence of being diagnosed with ADHD, depression, *or* an anxiety disorder (70.4%) than individuals identifying on the gender binary (40.9%; $X^2[1] = 18.32$, $p < .001$, OR = .229; see Table 2). The odds of being diagnosed with at least one of the three examined disorders in one's lifetime are 3.34 times greater (or 3.60 times greater when adjusted for age) for individuals identifying as transgender compared to individuals identifying as male or female. Individuals identifying as transgender were more likely than adults identifying on the gender

Table 2. Prior diagnostic information as a function of gender identification.

	Gender Binary				
	Male	Female	Total (Binary)	Transgender	Difference
Prior diagnostic history[a]					$X^2(1) = 18.32$, $p < .001$
No prior diagnosis reported	2,191 (65.4%)	1,646 (49.8%)	3,837 (57.6%)	16 (29.6%)	
Prior diagnosis reported	1,103 (32.9%)	1,622 (49.0%)	2,725 (40.9%)	38 (70.4%)	
Missing	55 (1.6%)	40 (1.2%)	95 (1.4%)	0 (0.0%)	
Diagnostic co-occurrence					$X^2(3) = 26.49$, $p < .001$
No diagnosis	2,191 (65.4%)	1,646 (49.8%)	3,837 (57.6%)	16 (29.6%)	
One disorder indicated	593 (17.7%)	715 (21.6%)	1,308 (19.6%)	14 (25.9%)	
Two disorders indicated	404 (12.1%)	766 (23.2%)	1,170 (17.6%)	17 (31.5%)	
Three disorders indicated	104 (3.1%)	137 (4.1%)	241 (3.6%)	7 (13.0%)	
Missing	57 (1.7%)	44 (1.3%)	101 (1.5%)	0 (0.0%)	
Overall breakdown					$X^2(7) = 30.28$, $p < .001$
No diagnosis	2,191 (65.4%)	1,646 (49.8%)	3,837 (57.6%)	16 (29.6%)	
Depression dx only	286 (8.5%)	441 (13.3%)	727 (10.9%)	9 (16.7%)	
ADHD dx only	172 (5.1%)	65 (2.0%)	237 (3.6%)	1 (1.9%)	
Anxiety dx only	135 (4.0%)	209 (6.3%)	344 (5.2%)	4 (7.4%)	
Depression + ADHD only	77 (2.3%)	66 (2.0%)	143 (2.1%)	3 (5.6%)	
Depression + anxiety only	293 (8.7%)	670 (20.3%)	963 (14.5%)	14 (25.9%)	
Anxiety + ADHD only	34 (1.0%)	30 (0.9%)	64 (1.0%)	0 (0.0%)	
All three	104 (3.1%)	137 (4.1%)	241 (3.6%)	7 (13.0%)	
Missing	57 (1.7%)	44 (1.3%)	101 (1.5%)	0 (0.0%)	

Notes. Omnibus chi-square tests were conducted using (binary = 1; trans = 0).
[a]For prior diagnostic history we assessed the age-adjusted chi-square calculations using the Cochran-Mantel-Haenszel test (CMH $X^2 = 20.94$, $p < .001$; Breslow Day $X^2 = 3.74$, $p = .291$; CMH Common OR = .278, $p < .001$).

binary to report a diagnosis of depression ($X^2[1] = 25.23$, $p < .001$, OR = .254; CMH Common OR = .235), anxiety ($X^2[1] = 17.00$, $p < .001$, OR = .328; CMH Common OR = .316), and ADHD ($X^2[1] = 5.57$, $p = .018$, OR = .457; CMH Common OR = .474). The odds of individuals identifying as transgender being diagnosed with any one of the examined disorders are two (ADHD) to four (depression) times greater than individuals who identify as male or female. Individuals identifying as transgender also reported significantly more co-occurring mental health conditions than adults identifying on the gender binary. Of individuals identifying as transgender, 44.5% reported having two or all three of the disorders examined; whereas, only 21.2% of men and women reported ever being diagnosed with two or more disorders ($X^2[1] = 26.51$, $p < .001$, OR = .201; see Table 2). That is, the odds of being diagnosed with two or more of the three examined disorders are five times greater for individuals identifying as transgender compared to individuals identifying as male or female.

Age of initial diagnosis

Age of onset differed for individuals as a function of gender identity for diagnoses of anxiety and depression (but not ADHD)—that is, individuals identifying as transgender reported being initially diagnosed, on average, at a younger age than those identifying as male or female for anxiety and depression diagnoses (ps < .001; see Table 3). Age of diagnosis of depression appeared to peak for transgender individuals by adolescence, relative to individuals identifying as male or female, with the majority of individuals identifying as transgender reporting having been diagnosed with depression prior to adulthood. Likewise, all of the individuals identifying as transgender reported having received a diagnosis of anxiety prior to adulthood, relative to the approximately one-third of individuals identifying as male or female who reported a diagnosis of anxiety in adulthood.

Discussion

The current study anonymously surveyed non–treatment-seeking individuals to investigate the sample of transgender individuals in the United States in online samples and the lifetime diagnostic rate of common mental health disorders (depression, anxiety, and ADHD) for individuals self-identifying as transgender compared to individuals self-identifying as men or women. First, we found that 0.8% of the adults in the current MTurk sample self-identified as transgender. As noted in a report compiled by the World Professional Association for Transgender Health, studies on prevalence are largely missing, as "efforts to achieve realistic estimates are fraught with enormous difficulties" (p. 169), with fewer estimates available in the

Table 3. Diagnostic information with age of onset per disorder as a function of gender identity.

	Gender Binary				
	Male	Female	Total (Binary)	Transgender	Difference
Depression [a]					$X^2(1) = 25.23, p < .001$
No	2,519 (75.2%)	1,937 (58.6%)	4,456 (66.9%)	18 (33.3%)	
Yes	760 (22.7%)	1,314 (39.7%)	2,074 (31.2%)	33 (61.1%)	
missing	70 (2.0%)	57 (1.7%)	127 (1.9%)	0 (0.0%)	
Age of Dx (Depression)					$X^2(3) = 14.57, p = .002$
Childhood (0–12)	49 (6.5%)	81 (2.4%)	130 (6.3%)	3 (9.1%)	
Adolescence (13–17)	232 (30.6%)	429 (13.0%)	661 (32.0%)	20 (60.6%)	
Emerging adulthood (18–25)	312 (41.2%)	469 (14.2%)	781 (37.8%)	8 (24.2%)	
Adulthood (26+)	164 (21.7%)	330 (10.0%)	494 (23.9%)	2 (6.1%)	
ADHD [b]					$X^2(1) = 5.57, p = .018$
No	2,899 (86.6%)	2,962 (89.5%)	5,861 (88.0%)	43 (79.6%)	
Yes	387 (11.6%)	298 (9.0%)	685 (10.35)	11 (20.4%)	
missing	63 (1.8%)	48 (1.5%)	111 (1.7%)	0 (0.0%)	
Age of Dx (ADHD)					$X^2(3) = 3.405, p = .333$
Childhood (0–12)	161 (41.6%)	71 (23.8%)	232 (40.1%)	2 (18.2%)	
Adolescence (13–17)	86 (22.2%)	74 (24.8%)	160 (27.6%)	5 (45.5%)	
Emerging adulthood (18–25)	103 (26.6%)	84 (28.2%)	187 (32.3%)	2 (18.2%)	
Adulthood (26 +)	37 (9.6%)	69 (23.2%)	106 (15.5%)	2 (18.2%)	
Anxiety [c]					$X^2(1) = 17.00, p <.001$
No	2,712 (81.0%)	2,204 (66.6%)	4,916 (73.8%)	25 (46.3%)	
Yes	566 (16.9%)	1,046 (31.6%)	1,612 (24.2%)	25 (46.3%)	
missing	71 (2.1%)	58 (1.8%)	129 (1.9%)	4 (7.4%)	
Age of Dx (Anxiety)					$X^2(3) = 11.13, p = .011$
Childhood (0–12)	31 (5.3%)	42 (3.9%)	73 (4.4%)	2 (8.0%)	
Adolescence (13–17)	135 (23.2%)	214 (19.9%)	349 (21.1%)	8 (32.0%)	
Emerging adulthood (18–25)	241 (41.5%)	451 (42.0%)	692 (41.8%)	15 (60.0%)	
Adulthood (26 +)	156 (27.7%)	337 (32.3%)	493 (30.7%)	0 (0.0%)	

Notes. Omnibus chi-square tests were conducted using (binary = 1; trans = 0). The Cochran-Mantel-Haenszel test age-adjusted chi-square/OR.
[a]For depression: CMH $X^2 = 28.90$, $p < .001$; Breslow Day $X^2 = 3.21$, $p = .361$; CMH Common OR = .235, $p <.001$.
[b]For ADHD: CMH $X^2 = 5.00$, $p = .025$; Breslow Day $X^2 = 0.36$, $p = .948$; CMH Common OR = .474, $p = .029$.
[c]For Anxiety: CMH $X^2 = 18.24$, $p < .001$; Breslow Day $X^2 = 2.66$, $p = .446$; CMH Common OR = .316, $p < .001$.

United States and estimates largely considered to be a minimum estimate (Coleman et al., 2012). Published estimates (e.g., 0.3%; Gates, 2011) are somewhat lower than the current study, but this is likely due to challenges of defining gender and obtaining a representative sample. This collective work should be considered a starting point to encourage more rigorous and refined epidemiologic study.

Relative to mental health concerns, we found that individuals who identify as transgender are more likely to report a history of a diagnosis of depression, anxiety, and/or ADHD than individuals identifying as male or female. Notably, rates of prior depression (61.1%), anxiety disorder (46.3%), and ADHD (20.4%) diagnoses reported by adults identifying as transgender are substantially higher than epidemiological estimates of the national lifetime prevalence of mood disorders (21.4%; Kessler et al., 2007), of anxiety disorders (31.0%; Kessler et al., 2007), and of ADHD (11%; Visser et al., 2014). Future research is needed to replicate these findings of the high rate of mental health diagnoses and co-occurring disorders in the transgender population. If these findings are replicated, forthcoming research should explore potential underlying characteristics that might increase the risk of developing various mental health disorders that might substantiate the minority stress model for transgender individuals (Hendricks & Testa, 2012). There is also a need for future research to explore whether transgender adults are at increased risk for other mental health concerns (e.g., substance use disorders, eating disorders).

Consistent with prior research, our results indicated that adults identifying as transgender were more likely to be diagnosed with depression and anxiety at a younger age than individuals identifying as men or women. If these findings are replicated, this would be particularly worrisome given that diagnoses of depression and anxiety earlier in development are associated with worse outcomes throughout later development (Bittner et al., 2007; Luby, 2010).

One of the findings that surprised us was that transgender adults were disproportionately likely, relative to men or women, to report a diagnosis of ADHD. Although there is some evidence to indicate that transgender youth are more likely to have other

neurodevelopmental conditions, such as autism spectrum disorders (De Vries, Noens, Cohen-Kettenis, Van Berckelaer-Onnes, & Doreleijers, 2010), this is the first study to highlight elevated rates of ADHD in transgender adults. These data raise opposing questions. On the one hand, there is the question of whether the development of a gender identity might be related to neurodevelopment; on the other hand, there is the question of whether the diagnoses of ADHD in transgender individuals have been accurate. With regard to the potential for misdiagnoses, it may be worthwhile to consider that youth who are gender nonconforming often present with externalizing behaviors (Coleman et al., 2012), which may be incorrectly attributed to ADHD by mental health workers. Misattributing behavioral profiles as symptomatic of ADHD when they may be more characteristic of transgender individuals than cisgender individuals may be due to mental health workers or physicians having insufficient competency to properly assess for ADHD in transgender adults. The danger of misdiagnosis with a mental health disorder, particularly ADHD, for individuals with gender nonconforming identities cannot be overstated. Concerns might include invalidating the individual's struggle with gender identity by assigning an inappropriate mental health label, overmedicating the individual with stimulants or psychotropic medication, further stigmatizing the individual with mental health labels, or further distancing the individual from seeking support from mental health professionals. Regardless, additional research is warranted.

Despite the strengths of the current work (i.e., large online sample and anonymous survey), there are a number of limitations that must be acknowledged. First, although our sample overcomes many barriers of previous research (e.g., large online sample using anonymous survey methods recruited from a diverse population), the method we used to collect this data is not without limitations. First, our sample is a convenience sample and thus is not as representative as national probability samples (Sheehan & Pittman, 2016). Moreover, our sample tends to be more representative of Internet users and younger individuals, indicative of bias that cannot be generalized to the general population or even the MTurk population at large. Additionally, some evidence suggests that MTurk workers engage in malingering greater than accepted norms would suggest due perhaps to outdated malingering measures, providing incentive to participate, or unknown third factors (cf. Chandler & Shapiro, 2016). Although the potential for response deceit is a notable limitation regardless, we did attempt to decrease this limitation wherever possible by excluding participants with suspicious/inconsistent response patterns and by using a broad study description so as to not influence response pattern for incentive ("Short Pre-Screen Survey for Larger Study About Relationships"). An additional limitation of our method is that, because this survey was used as a screener for a larger study, we did not obtain ethnicity information to inform the diversity of our sample, which is a notable deficit.

Another limitation in our study involves the gender identity categories we used. "Transgender/gender-variant" is not the most inclusive category to identify individuals who are gender nonconforming (e.g., gender neutral). We did not assess gender on a continuum nor did we assess the various types of transgender identities. Additionally, it is unclear whether individuals who transition from one gender category to another or who identify with a gender category different from their birth-assigned sex identify as transgender/gender-variant or whether they identify on the gender binary when given the option; that is, individuals identifying as "male" or "female" may not be cisgender. In a study by Clements-Nolle, Marx, Guzman, and Katz (2001), when given the opportunity, individuals who transitioned from male-to-female and female-to-male predominantly identified with "transgender," "transsexual," or "other" (66% and 67%, respectively). However, a large proportion identified with the opposite gender of their birth (i.e., female and male). Our study cannot clearly differentiate between individuals who identify in ways that differ from their birth-assigned sex but instead identifies only individuals who chose an option other than male or female when asked to report their *gender*. Recent research findings indicate that asking about both gender identity and birth-assigned sex not only increases the general response rate to questions about gender/sex but also increases the percentage of individuals identifying as transgender (Tate, Ledbetter, & Youssef, 2013), further indicating the limitation of our response options. Thus, if we were to include more response options, it is possible (and perhaps likely) that the prevalence of genderqueer individuals would be higher than we reported. Despite this limitation, we

believe that individuals who identify as transgender as opposed to male/female, when given the option, are an important population to assess. Regardless, researchers acknowledge that terminology in regard to gender categories likely varies by culture and is "time-dependent and … rapidly evolving" (p. 167). The way we define gender identity remains largely an empirical question (Coleman et al., 2012; Tate et al., 2013). Therefore, lack of inclusivity or attempts to be overly inclusive should not limit future attempts to begin to understand the prevalence and needs of gender-variant individuals. Future research should consider assessing gender with more broad categories (e.g., a gender spectrum) or by allowing more response options (e.g., options such as gender nonconforming, transgender female, transgender male, genderqueer or an open-ended response option for gender identity). Future researchers utilizing the advantages of the MTurk population should broaden their investigation by assessing for the association between gender identity, using a more inclusive spectrum and assessing for birth-assigned sex and mental health prevalence.

Finally, our mental health diagnostic history data were collected via self-report with no additional measures permitting validation of an evidence-based diagnosis. It is possible that rates of mental health diagnoses described herein would differ from those discerned through other means (e.g., conducting diagnostic interview) or may be otherwise biased. However, it is possible that these ratings reflect rates of diagnoses given in the medical community more broadly that are not necessarily empirically based, which might also reflect an important area of research for minority populations. Further, many normalized diagnostic assessment instruments used in research are based on binary gender norms, which may challenge the utility or interpretation of our actuarial diagnostic tools (or even clinical judgment) for individuals who do not identify as male or female. As such, future research should explore how gender identity versus sex assignment at birth may differ on assessment tools to uncover potential for bias and increase confidence in our diagnostic tools with this population and assumptions of professionals providing mental health diagnoses.

In sum, the extant research regarding topics on gender nonconformity is quite limited and based mainly on restrictive samples that largely cannot generalize (including the present study), which only further promulgates the deficiency in our collective knowledge about this vulnerable population. We included gender options in our research survey, which was generally unrelated to issues of gender identity. We found interest in the number of individuals reporting transgender identities and their self-report of mental health concerns. We argue that mainstream psychology should embrace the necessity to conduct research on this vulnerable population, and the present study, we hope, lays the foundation for future work with this population. We underscore the potential utility of using the Internet to conduct gender-identity research. Considering that transgender individuals often turn to the Internet to identify a community and peer support (Coleman et al., 2012; Mustanski, 2001), online research and clinical outreach may strengthen our outreach to and connection with this population. The Internet may also prove to be a fruitful option for mental health interventions for this stigmatized population (i.e., e-therapy; Coleman et al., 2012).

Note

1. We limited participation to U.S. residents, but we did not ask state of residence on this larger study. In a separate study conducted using a smaller subset of this sample, participants reported residing in 43 states in the United States and the District of Columbia, suggesting general national representativeness by state.

Declaration of interest

All authors declare no conflicts of interest, financial or otherwise.

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